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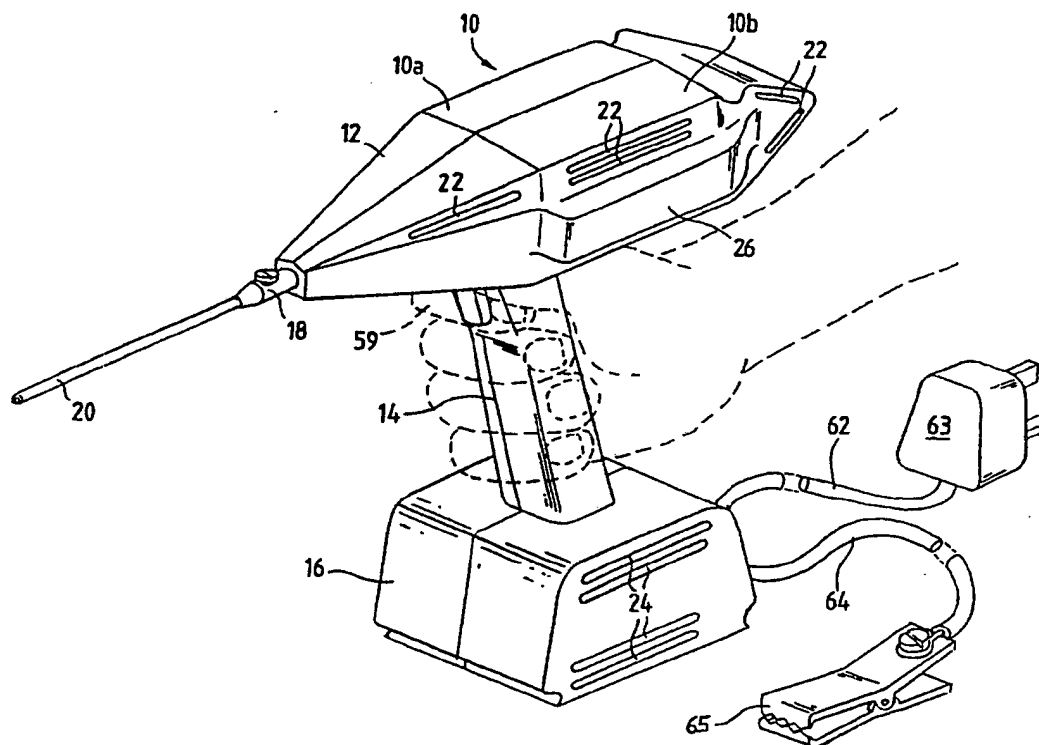
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(54) Title: AN ARC WELDING DEVICE



(57) Abstract

The arc welding device comprises a body (10) having a transformer housing (12) for a transformer (30) a handle (14) and a drive circuit housing (16). The device forms a compact single unit arc welder which can be plugged into a mains socket (67) ready for immediate use.

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AN ARC WELDING DEVICE

The invention relates to an electric arc welding device which is particularly, but not exclusively, concerned with a device suitable for use in the DIY market.

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Welding apparatus proposed hitherto has comprised a  
5 relatively large steel box housing a transformer having  
an input connected, in use, to a mains voltage by a  
cable. The metal box has two output terminals thereon,  
one being connected, in use, to a welding electrode  
holder and the other being for connection to an earth  
10 clamp. The connections both to the welding electrode  
holder and the earth clamp are via relatively short  
cables and the user needs to have the transformer  
fairly close to the workpiece. Not only does the large  
transformer create storage problems for the DIY person  
15 but it takes time to set up the welding apparatus in  
that the electrode holder and the earth clamp cable  
need to be connected up to the terminals on the metal  
box. Also, the relatively short cables on the  
electrode holder and earth clamp can be  
20 disadvantageous.

An object of the present invention is to provide an arc welding device which is more versatile than the type set out above and which is far less cumbersome.

According to one aspect of the apparatus invention there is provided an electric arc welding device comprising a body which, in use, carries an arc welding electrode, the body housing a transformer which  
5 supplies welding current to the electrode.

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With such an arrangement, the transformer and the electrode holder effectively form a single unit and the device is, therefore, far more compact than the apparatus of the prior.

10 Preferably, electrical means is provided which receives electric current from a supply and which modifies the character of the electric current to provide an input for the transformer. Preferably, the electrical means modifies (preferably increases) the frequency of the  
15 electric current from the supply.

The device can be made even more compact by housing the electrical means in the actual body. In that way, the electric arc welding device may be provided with a single lead to enable it to be connected to a  
20 conventional power point or to an extension lead from a power point and the complete device can be hand held to provide an extremely compact and versatile unit. Totally unlike the conventional and cumbersome unit requiring the large transformer box and the relative

heavy duty leads required to connect the electrode holder to the terminals on the box.

In order to ensure that heat generated by the electrical means can easily be dissipated, suitable  
5 ~~heat dissipating means such as metal heat sinks can be~~  
provided adjacent the electrical means. The electrical means may include component circuit boards which can conveniently be mounted on the heat dissipation means.

Conveniently, two elements defining heat dissipation  
10 means may be spaced apart and the circuit boards mounted thereon so as to define therebetween an open space into which components on the circuit boards project. The circuit boards and heat dissipation elements then conveniently make up a complete unit for  
15 easy assembly into the body.

Preferably, the body includes a first section which houses the transformer and a second section which defines a handle.

The second section forming the handle is preferably  
20 elongate with the first section arranged at one end thereof.

In use, the first section is preferably arranged at the

upper end of the second section.

We prefer the body to include a third section which houses at least part of the said electrical means. The second section preferably extends between the first and ~~third sections and the second section may conveniently~~ house part of the electrical means. In that way, efficient use is made of available space within the body. For convenience, the first and third sections are hollow box sections of substantial size whereas the  
10 second section defining the handle is relatively narrow to enable it to be grasped easily by a user.

We prefer to distribute weight in the device so as to provide a downward bias on the welding electrode when the arc welding device is in use. That may be achieved  
15 by making the weight of the upper end of the second section, which defines the handle, greater than that at the lower end of the handle. We prefer to arrange for the weight of the transformer in the first section to be slightly greater than that of weight means on a part  
20 of the body, e.g., in the said third section, spaced from the transformer. Conveniently, the weight means may be provided at least in part by the aforesaid heat dissipating means.

The first section may carry a suitable holder means for

the welding electrode.

The aforesaid electrical means may include a section which increases the frequency of the electric current from the supply. The said section which increases the frequency preferably provides an input for a further section which provides a voltage output at the increased frequency higher than the voltage of the supply. The voltage output at increased frequency from the further section may be provided as an input to the transformer which provides the welding current.

Sensor means may be provided which is sensitive to the welding current and which provides a feedback to a section of the electric means, preferably the section which increases the frequency of the current from the supply.

A temperature sensing device may be provided which is operable to switch off the section for increasing the frequency of the current from the supply if the temperature, at least in the region of the transformer, increases beyond a desired level.

A switch may be mounted on the body, preferably on the second section forming the handle, for operating the device. The provision of the switch is most convenient

as a user can simply switch the device on and off with a finger when holding the device by the handle. The switch is preferably of a kind which will allow the device to operate only whilst the switch is being  
5 depressed. Therefore, when the device is put down on a bench, the switch will be biased into an "off" position which is desirable from a safety point of view.

The device may conveniently be stowed in a carrying case at least part of which case takes the form of a  
10 face shield for use when operating the device. That is a particularly useful feature as the case then serves a dual purpose.

According to a further aspect of the invention there is provided a case for an electric arc welding device at  
15 least part of which case defines a face shield for use when operating the device.

The case referred to in either of the two immediately preceding paragraphs may comprise a tray part arranged to contain the welding device and a lid part which can  
20 at least partly close the tray part, one of said tray and lid parts defining said face shield.

The tray and lid parts may be detachably interconnected to allow the part which defines the face shield to be

detached from the other part when the face shield is in use.

Conveniently, the tray and lid parts may be hingeably interconnected. The hinge interconnection may permit

5 detachment of the lid part from the tray part only after the lid part has been moved into an open position.

The aforesaid hinge interconnection may include at least one stub shaft or an equivalent thereof on the  
10 lid part which locates in a recess in the tray part so that when the lid part is closed, co-operable sections of the tray and lid parts retain the stub shaft in the recess.

Conveniently, two coaxial stub-shafts may be provided  
15 for location in respective said recesses.

The tray and lid parts may be hingably connected on a rear wall of the tray part, e.g., on a front wall of the tray part.

At least part of a fastening means may be provided to  
20 inhibit opening of the lid part and the fastening means may be provided at least partly on a further wall of the lid and/or tray part.

The invention will now be described by way of example with reference to the accompanying drawings in which:-

Fig.1 is a perspective view of a welding device in accordance with the invention,

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5 Fig.2 is a sectional elevation of the welding device shown in Fig.1 showing internal components of the welding device,

Fig.3 is a block circuit diagram of circuitry for the welding device shown in Figs.1 and 2,

10 Fig.4 is a perspective view of circuit boards mounted on heat sinks,

Fig.5 is a diagrammatic view of the welding device indicating weight distribution.

Fig.6 is a perspective view of a case for the welding  
15 device,

Fig.7 is a detailed view of part of the case shown in Fig.6 showing a hinged-type connection and

Fig.8 is a cross section through a lid of the case

shown in Fig.6 in use as a face shield,

In Fig.1, the arc welding device comprises a body 10 having a transformer housing 12, a handle 14 and a drive circuit housing 16. The transformer housing handle and drive circuit housing constitute the aforesaid first, second and third sections of the body. As shown clearly in Fig.1, the transformer housing is arranged at the upper end of the handle 14 and the drive circuit housing at the lower end. Preferably, the body 10 is made in two halves 10a, 10b each of which halves comprises integrally formed halves of the transformer housing, handle and drive circuit housing. Conveniently, the body halves 10a, 10b may be formed by injection moulding and subsequently glued or otherwise joined together.

The transformer housing tapers towards its left-hand end as viewed in the drawings and carries an electrode holder 18. The electrode holder 18 is used to carry a normal arc welding electrode 20.

The transformer housing 12 is formed with a number of louvres 22 to enable cooling air to pass through the housing. Similarly, the drive circuit housing 16 is also formed with louvres 24. The transformer housing 12 is formed with hollow projections 26 which locate

laminations 28 (Fig.2) of a transformer 30.

A major part of the drive circuitry (indicated generally at 32 in Fig.2 and constituting the aforesaid electrical means) is contained within the drive circuit

5 housing 16 and comprises spaced apart circuit boards 34, 36 carrying components of the circuitry. The circuit boards are mounted on two spaced apart heat sinks 38 made of aluminium and each of which comprises a main plate 40 having a plurality of cooling fins 42  
10 projecting therefrom. The circuit boards 34, 36 are secured to the heat sinks 38 by bolts 44 which extend through spacers 46 between the circuit boards 34, 36 and adjacent surfaces of the heat sinks 38.

The drive circuit 32 includes two cylindrical  
15 capacitors 48 which are arranged end to end in a section 50 of the handle 14. The section 50 is defined between a wall 52 of the handle 14 and an internal partition 54.

The handle 14 is formed with an aperture immediately  
20 beneath the transformer housing 12 in which is mounted an on-off switch 58. The switch 58 is spring biased into an "Off" condition and constant manual pressure by a finger 59 of a user is required to hold it in an "On" condition.

The drive circuit housing 16 is formed with an aperture 60 through which pass a mains supply cable 62 and an earth cable 64. The mains supply cable 62 is connected to a plug 63 and the earth cable 64 is connected to an  
5 earth clamp or clip 65.

The weight of the heat sinks 38 (which can, if desired, be supplemented by additional weights) and that of components of the drive circuit mounted thereon together with the weight of the transformer 30 and  
10 electrode holder 18 are such so as to provide effective weights W1 W2 at the upper and lower ends of the handle 14 respectively as shown in Fig.5. W1 is slightly greater than W2 so as to provide a slight downward bias B at the tip of the welding electrode 20 when welding  
15 with the welding device tipped forwardly as shown in Figure 5. In Fig.5 the welding device is shown plugged into a mains supply socket 67 with the earth clamp 65 attached to a workpiece 69. In that condition the welding device is ready for use.

20 With reference to Fig.3, the drive circuit 32 comprises a rectifier 66 which receives current through the supply cable 62 from the mains socket 67. Transformer 68 receives current from the rectifier 66 and provides an input for a section 70 of the drive circuit 32 which

modifies electrical frequency. The circuit section 70 provides a square wave output 72 of high frequency (preferably several kHz). The square wave output 72 is fed to a primary coil winding 74 associated with a secondary coil winding 76. Two outputs are taken from the secondary coil winding 76 to provide a first square wave 78 and a second inverse square wave 79 which are fed to power switching circuits 80, 82. The circuits 80, 82 receive inputs from the rectifier 66 and have outputs which are commoned at 83 to provide a single input 84 to a primary coil winding 86 of the transformer 30. The action of the rectifier 66 is smoothed by the capacitors 48 which are also connected to the primary coil winding 86 of the transformer 30. A secondary coil winding 88 of the transformer is connected to the electrode holder 18 and to the earth clamp cable 64.

The switch 58 is connected in the circuit section 70 to enable that circuit section to be switched on and off by the user and a temperature sensor 90 is arranged in the vicinity of the transformer 30. The temperature sensor 90 is associated with a switching circuit 92 which inhibits operation of the circuit section 70 once the sensed temperature reaches a particular level. The circuit 92 will switch on the circuit section 70 again once the temperature falls to a given level. The

finger operated switch 58 is most useful in that if the electrode 20 "sticks" to the workpiece 69 when attempting to strike an arc, release of the switch 58 will switch off the welding current enabling the  
5 electrode to be freed. The prior art apparatus has no such facility.

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Current flowing through the earth cable 64 or input 84 is sensed, e.g., by a surrounding coil 94 so as to provide a feedback for the circuit section 70 to  
10 prevent saturation of the circuit section as a result of driving the power switch circuits 80, 82.

Reference is now made to Figures 6 to 8 which show a case 99 for the welding device.

The case 99 comprises a tray 100 and a lid 102 which  
15 are hinged together by a hinged arrangement shown in detail in Fig.7.

The tray 100 may be provided with an internal vacuum formed insert (not shown) which locates the body 10 of the welding device securely in the tray. The tray 100  
20 has a front wall 104 a rear wall 106 and two side walls 108. The tray 100 may be vacuum or otherwise formed to define an inset peripheral lip 110.

At the ends of the rear wall 106, the peripheral lip 110 is formed slightly thicker and defines two U-shaped cross section recesses 112 as shown in Fig.7. The recesses 112 receive respective stub shafts or  
5 projections 114 formed on a mounting 116 integral with the lid 102. The stub shafts 114 locate in the recesses 112 so that when the lid is closed, a front wall 118 of the lid 102 lies in front of the lip 110 on the front wall 104 of the tray so that the stub shafts  
10 114 cannot disengage the recesses 112. However, once the lid 102 is pivoted upwardly so that the front wall 118 thereof clears the lip 110 on the front wall 104 of the tray, the stub shafts 114 can be disengaged from the recesses 112 to enable the lid and the tray to be  
15 separated. The lid 102 is in the form of a face shield having a main wall 120 having an aperture therein which is covered by a sheet of darkened glass 122. The darkened glass 122 is held in position by means of plastic strips 124 which may be secured to the main  
20 wall 120 by means such as screws or rivets. A support bracket 126 is also suitably secured to the main wall 120. In the embodiment illustrated, the support bracket 126 is in the form of a channel cross-section element which, together with the main wall 120 forms an  
25 elongate socket 128 for a complementary-shaped projection 130 formed on a handle 132. Normally, the handle 132 is stored within the tray 100 but can be

fitted into the socket 128 as shown in Fig.8 to enable a user to hold the lid 102 as a shield when using the welding device.

Suitable fasteners 134a, 134b are provided on the front  
5 wall 118 of the lid and the front wall 104 of the tray  
to enable the lid to be held in a closed position.

A carrying handle 136 is provided on the front wall 104  
of the tray.

The term "arc welding" as used herein also embraces arc  
10 brazing.

The term "transformer" used herein includes any device  
for obtaining an electric current from one of a  
different voltage.

It is envisaged that the case shown in Fig.4 could be  
15 used for arc welding apparatus other than that shown in  
Fig.1.

A preferred welding current output is around 50 amps  
which is ideal for welding typical steel material up to  
around 3mm.

20 The welding device is far more versatile than the

conventional type of welding apparatus which requires the aforesaid large metal box housing the transformer and connecting cables for the electrode holder. With the device the user simply plugs the device into a  
5 mains socket, inserts an electrode into the holder 18 and is immediately ready to begin welding. the only constraint is the length of the supply cable 62 which can easily be lengthened by a conventional extension lead. The "balance" of weights W1, W2 give the device  
10 a good "feel" to the user. Thus the invention is a compact, convenient and easy to use device ideal for D.I.Y.

CLAIMS

1. An electric arc welding device comprising a body which, in use, carries an arc welding electrode, the body housing a transformer which supplies welding  
5 current to the electrode.
2. An electric arc welding device according to Claim 1 in which electrical means is provided which receives electric current from a supply and which modifies the character of the electric current to  
10 provide an input for the transformer.
3. An electric arc welding device according to Claim 2 in which said electrical means modifies the frequency of the electric current from the supply.
4. An electric arc welding device according to  
15 Claim 2 or 3 in which the said electrical means is housed in the body.
5. An electric arc welding device according to Claim 2, 3 or 4 in which heat dissipation means is provided adjacent said electrical means.
- 20 6. An electric arc welding device according to any preceding Claim in which the body includes a first

section which houses the transformer and a second section which defines a handle.

7. An electric arc welding device according to Claim 6 in which the second section is elongate and the first section is arranged at one end of the second section.

8. An electric arc welding device according to Claim 7 in which the first section, in use, is arranged at an upper end of the second section.

9. An electric arc welding device according to Claim 6, 7 or 8 when appendant to Claim 4 or 5 in which the body includes a third section which houses at least part of said electrical means.

10. An electric arc welding device according to Claim 9 in which the second section extends between the first and third sections.

11. An electric arc welding device according to Claim 10 in which the second section houses another part of the electrical means.

12. An electric arc welding device according to Claim 9, 10 or 11 in which the first and third sections

are hollow substantial box-like sections with a relatively narrow said third section therebetween.

13. An electric arc welding device according to any of Claims 6 to 12 in which the weight of the device  
5 is distributed to provide a downward bias, in use, at a tip of the welding electrode.

14. An electric arc welding device according to Claim 13 in which the weight of the transformer in the first section means includes heat dissipation means for  
10 said electrical means.

15. An electric arc welding device according to any of Claims 6 to 14 in which the first section carries holder means for the welding electrode.

16. An electric arc welding device according to  
15 Claim 2 and any preceding Claim appendant to Claim 2 in which the electrical means includes a section which increases the frequency of the electrical current from the supply.

17. An electric arc welding device according to  
20 Claim 16 in which the said section which increases the frequency provides an input for a further section which provides a voltage output at the increased frequency

higher than voltage of the supply.

18. An electric arc welding device according to Claim 17 in which the voltage output of the further section at increased frequency is provided as an input  
5 to the transformer which provides the welding current.

19. An electric arc welding device according to Claim 16, 17 or 18 in which sensor means is provided which is operable in response to welding current and which provides a feedback to the section of the  
10 electrical means which increases the frequency of the current from the supply.

20. An electric arc welding device according to any of Claims 16 to 19 in which a temperature sensing device is provided which is operable to switch off the  
15 section for increasing the frequency of the current from the supply if the temperature at least in the region of the transformer increases beyond a desired level.

21. An electric arc welding device according to  
20 any preceding Claim in which a switch is mounted on the body for operating the device.

22. An electric arc welding device according to

Claim 21 and where the said second section is provided, in which the switch is mounted on the second section.

23. An electric arc welding device according to any preceding Claim in which the device is stowed,  
5 prior to use, in a case at least part of which case comprises a face shield for use when operating the device.

24. An electric arc welding device in combination with a case for the device at least part of which case  
10 defines a face shield for use when operating the device.

25. An electric arc welding device according to Claim 23 or 24 in which the case comprises a tray part arranged to contain the welding device and a lid part  
15 which at least partly closes the tray part, one of said tray and lid parts defining said face shield.

26. An electric arc welding device according to Claim 25 in which the tray and lid parts are detachably interconnected to allow the part which defines the face  
20 shield to be detached from the other part when the face shield is in use.

27. An electric arc welding device according to

Claim 25 or 26 in which the tray and lid parts are hingeably interconnected.

28. An electric arc welding device according to Claim 27 in which the hinge interconnection permits  
5 ~~detachment of the lid part from the tray part only~~  
after the lid part has been moved into an open position.

29. An electric arc welding device according to claim 27 or 28 in which the hinge interconnection  
10 includes at least one stub shaft on the lid part which locates in a recess in the tray part so that when the lid part is closed co-operable sections of the tray and lid parts retain the stub shaft in the recess.

30. An electric arc welding device according to  
15 Claim 29 in which two coaxial stub-shafts are provided which locate in respective recesses.

31. An electric arc welding device according to any of Claims 27 to 30 in which the tray and lid parts are hingeably interconnected on a rear wall of the tray  
20 part and at least part of a fastening means to inhibit opening the lid part is provided on a further wall of the lid and/or tray part.

32. A case for containing an arc welding device prior to use, the case having features of the case referred to in any of Claims 23 to 31.

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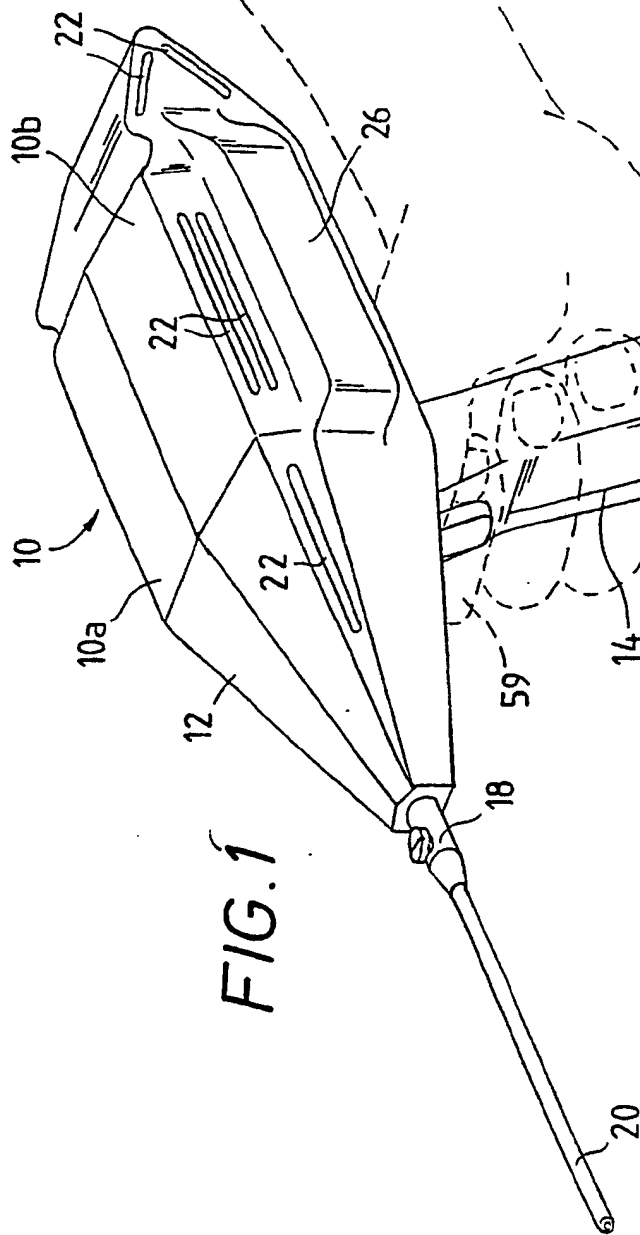


FIG. 1

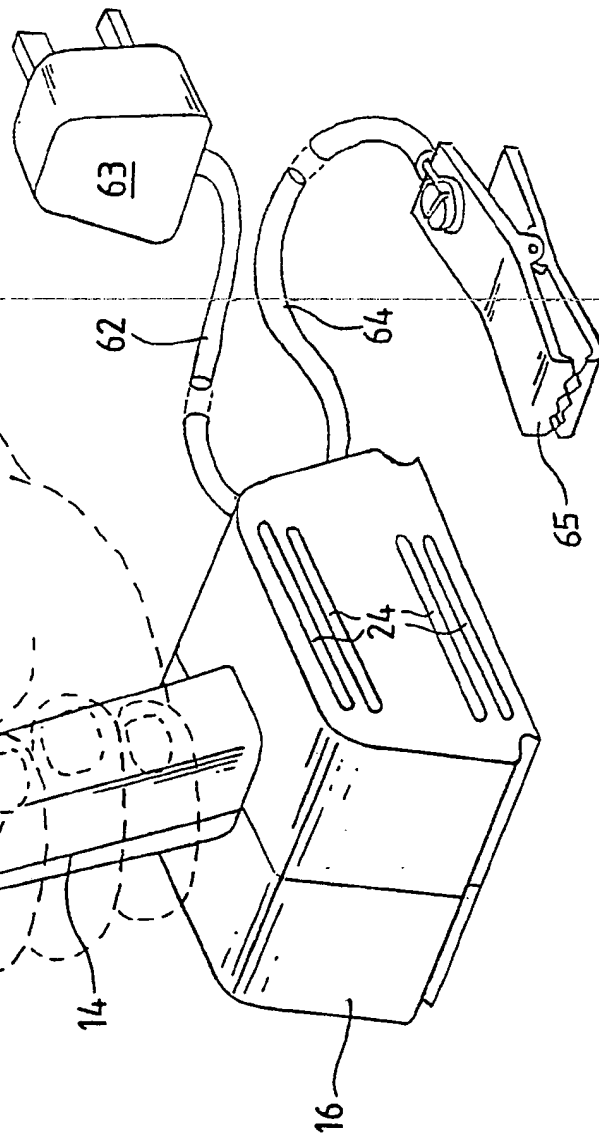
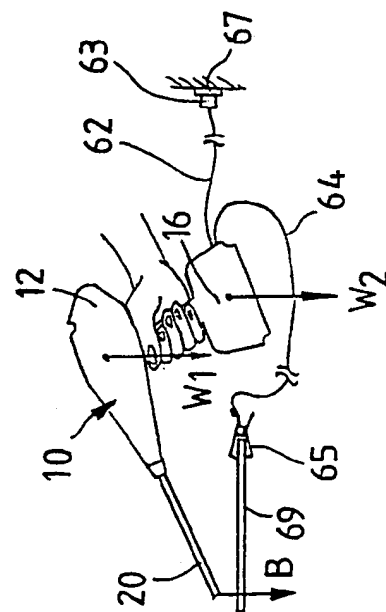
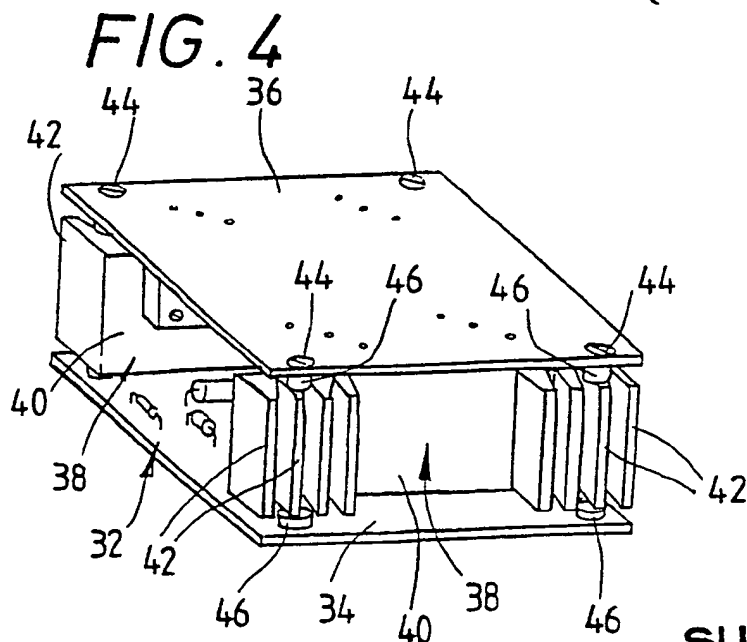
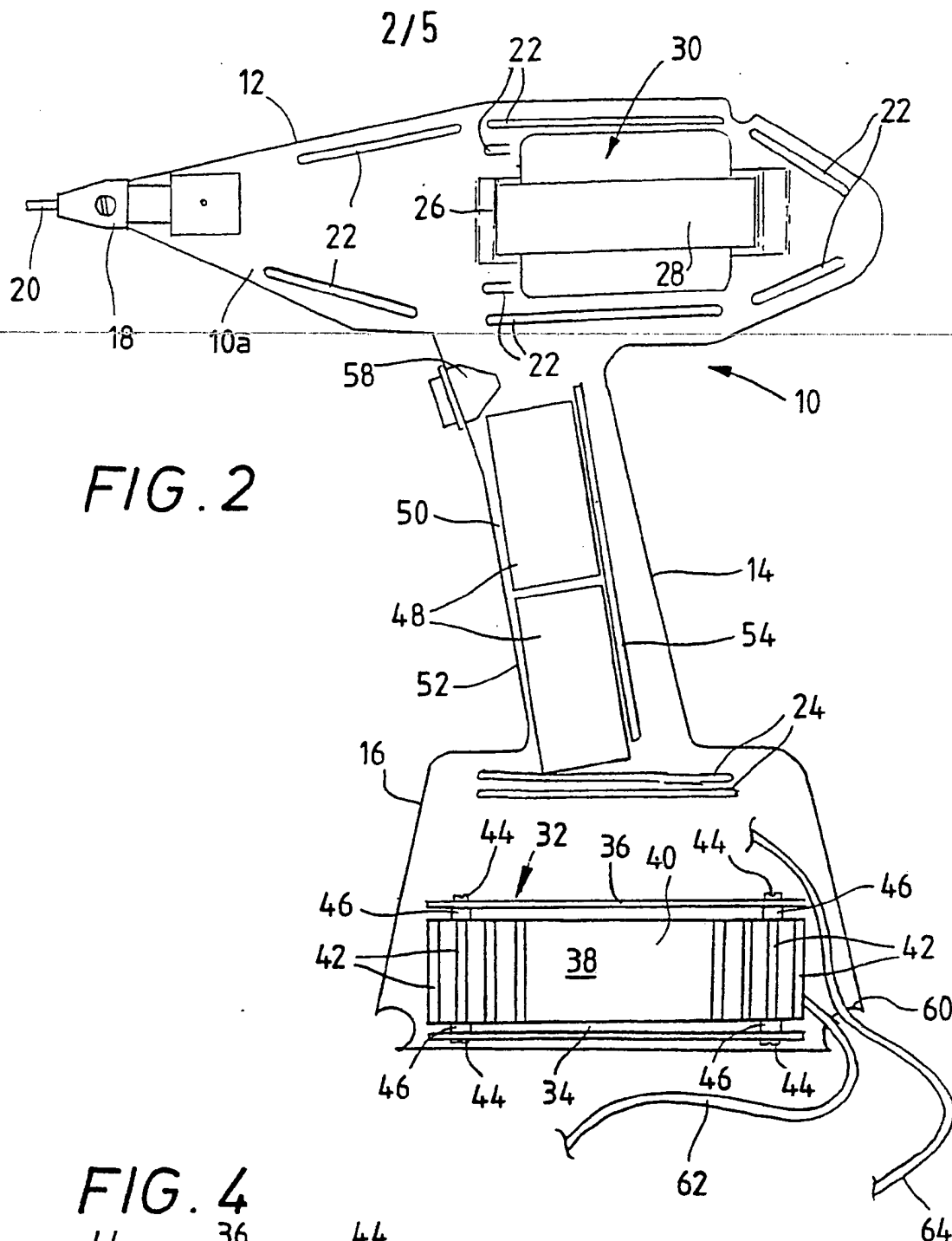


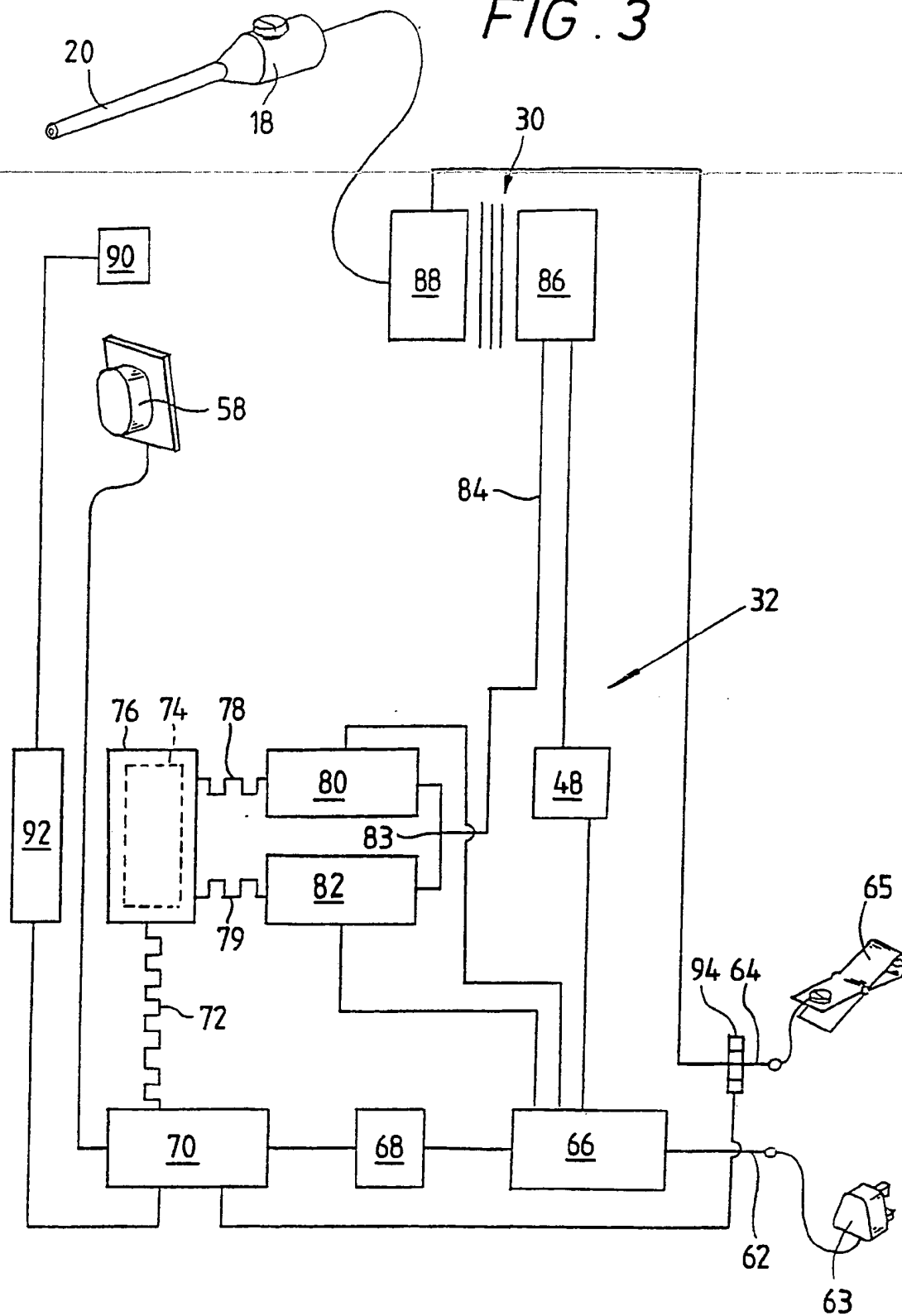
FIG. 5





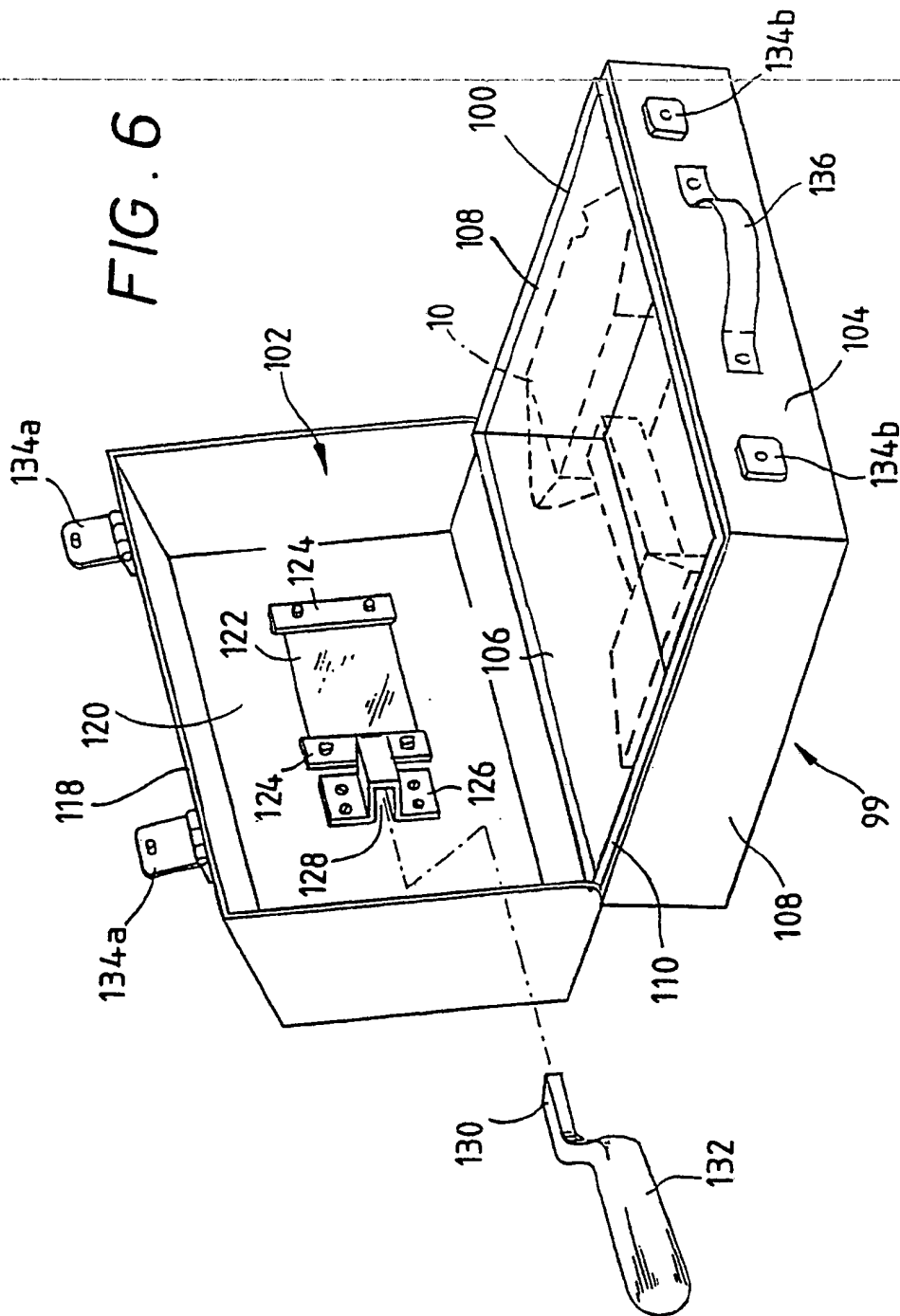
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FIG. 3



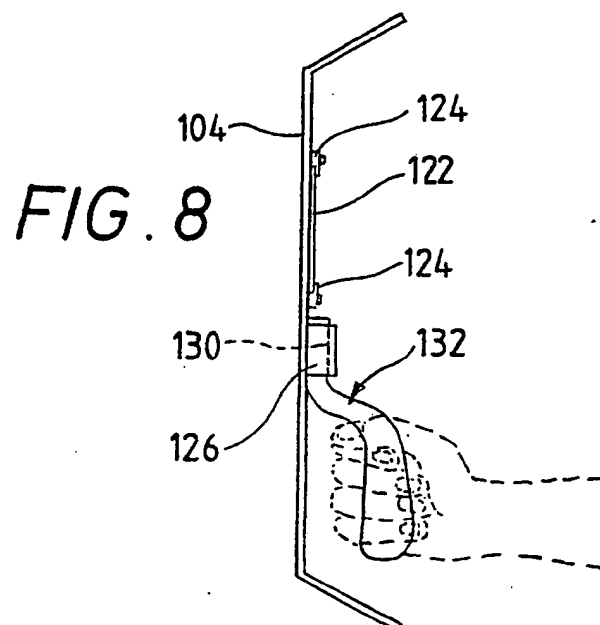
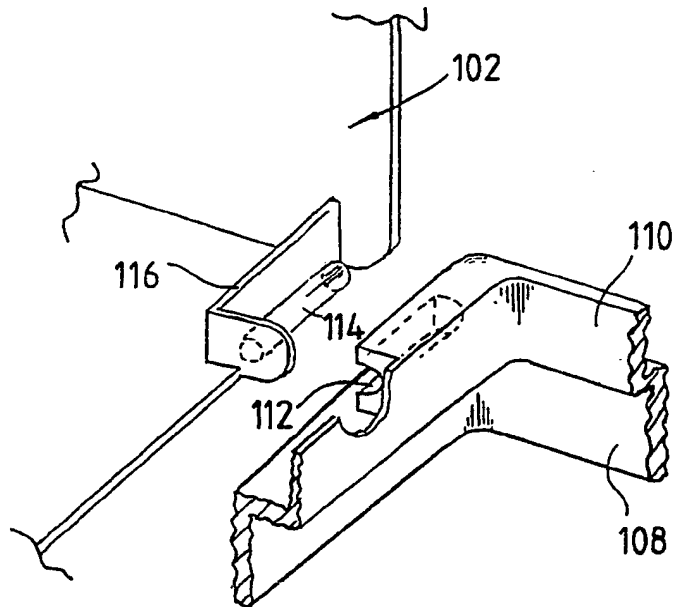
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*FIG. 7***SUBSTITUTE SHEET**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int.Cl. 5                      B23K9/28		
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Category <sup>10</sup>	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	GB,A,1216376 (EDEN) 23 December 1970 see page 1, line 75 - page 2, line 56; figures 1, 2	1, 6-8, 15
A	US,A,3706871 (WITHEROW) 19 December 1972 see column 2, line 15 - column 4, line 3; figures 1-5	1, 6, 7, 9, 10
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International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	DEMOLDER J. 	

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